MOORE INDUSTRIES

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PC-Programmable MODBUS Temperature Transmitter

TMZ TPRG

TMZ *PC-Programmable MODBUS Temperature Transmitter*

Left: TMZ TPRG: PC-Programmable MODBUS Temperature Transmitter
Right: TMZ HLPRG: PC-Programmable MODBUS Signal Converter

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Introduction

This is the users' manual for the Moore Industries TMZ PC-Programmable MODBUS Temperature Transmitter (TPRG: RTD, T/C, Ohms, mV and Potentiometer inputs). It contains all of the information needed to configure, install, operate and maintain this instrument.

About this Manual

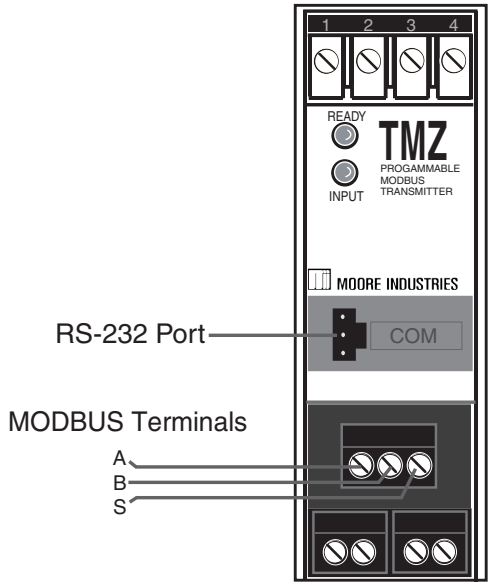
Wherever you see a "***Note***", "***Caution***" or "***WARNING***" pay particular attention.

WARNING - Hazardous procedure or condition that could injure the operator.

Caution - Hazardous procedure or condition that could damage or destroy the unit.

Note - Information that is helpful for a procedure, condition or operation of the unit.

Figure 1. *The TMZ (TPRG)*



The TMZ

The TMZ is a PC-Programmable, user-configurable, signal converter. It has a digital output and retains the high accuracy of an Analog to Digital converter without the limitation of low resolution which is associated with analog outputs. The multi-drop nature of the RS-485 port allows the connection of up to 32 units on a single drop of cable that consists of two pairs of wires. The TMZ has a READY LED to indicate the health of the unit and an INPUT LED to indicate status.

Model and Serial Numbers

Moore Industries uses the model and serial numbers of our instruments to track all information on each unit that we sell and service. If a problem occurs with your TMZ, check for a tag affixed to the unit listing these numbers. Supply the Customer Support representative with this information when calling.

Inputs

Refer to Table 4 for input ranges and accuracies of the TMZ (TPRG).

Outputs

The TMZ has a standard RS-485 port that supports the MODBUS RTU protocol.

Specifications

Performance

Input Accuracy: See Table 4
Overall Accuracy: The overall accuracy of the unit is the input accuracy. It includes the combined effects of linearity, hysteresis, repeatability and adjustment resolution. It does not include ambient temperature effect. For T/C input, add the RJC error.
Cold Junction Compensation Accuracy (T/C Inputs Only): ±0.45°C
Stability: See Table 1
Response Time: INPUT UPDATE TIME: 128msec; MODBUS POLLING TIME: Dependent upon how fast and how often a MODBUS master requests data
Isolation: Standard unit, 1000Vrms between case, input. 1500Vrms between power and input; WITH -RF OPTION, 500Vrms between case, input and power.
Power Consumption: 1W max.
Input Impedance: T/C and mV inputs, 40Mohms, nominal

Performance (continued)

Input Over-Range Protection: ±5Vdc
Excitation Current (RTD and Ohm Inputs Only): 250µA, ±10%

Communications

Type: Standard MODBUS RTU protocol interface over RS-485 (parameters as specified in U.S. Standard EIA-RS485)
Address Range: Configurable from 1 to 247. Unit will assume a MODBUS address of 01 by default.
Baud Rates: Interface supports the following: 300, 600, 1200, 2400, 4800, 9600, 19.2k and 38.4k
Character Format: One start bit, 8 data bits and one stop bit

Indicators

LED Type: INPUT LED: Dual color LED indicates input failure
READY LED: Green LED indicates unit is operating properly

Ambient Conditions

Operating & Storage Range: -40°C to +85°C (-40°F to +185°F)
Effect of Ambient Temperature on Cold Junction Compensation (T/C Inputs Only): ±0.005°C per °C change of ambient temperature
Relative Humidity: 0-95%, non-condensing
Ambient Temperature Effect: See Table 3
RFI/EMI Immunity (Standard Unit): 10V/m@20-1000MHz, 1kHz when tested according to IEC1000-4-3-1995 WITH -RF OPTION, 30V/m@20-1000MHz, 1kHz AM when tested according to IEC1000-4-3-1995
Noise Rejection: Common mode, 100dB@50/60Hz; Normal mode, Refer to Table 2

Weight 290 g (10.2 oz)

Specifications and information subject to change without notice.

Table 1. *Long-Term Stability*

Stability (% of maximum span)	Input-to-Output (Years)		
	1	3	5
RTD, Ohm & Pot Inputs	0.09	0.16	0.21
T/C & mV Inputs	0.08	0.14	0.18

Table 2. *Normal Mode Rejection Ratio*

Sensor Type		Max. p-p Voltage Injection for 100dB at 50/60Hz
T/C: J, K, N, C, E		150mV
T/C: T, R, S, B		80mV
Pt RTD: 100, 200, 300ohms		250mV
Pt RTD: 400, 500, 1000ohms		1V
Ni: 120ohms		500mV
Cu: 9.03ohms		100mV
Resistance	**mV**	
1-4kohms	250-1000	1V
0.25-1kohms	62.5-250	250mV
0.125-0.25kohms	31.25-62.5	100mV

Table 3. *Ambient Temperature Effect*

Input Type	Accuracy per 1°C (1.8°F) change in Ambient
*RTD	0.0035°C
Millivolt	0.5µV + 0.005% of reading
Ohm	0.002ohms + 0.005% of reading
Thermocouples	
Input Type	**Accuracy per 1°C (1.8°F) change in Ambient**
J	0.00016°C + 0.005% of reading
K	0.0002°C + 0.005% of reading
E	0.00026°C + 0.005% of reading
T	0.0001°C + 0.005% of reading
R, S	0.00075°C + 0.005% of reading
B	0.0038°C + 0.005% of reading
N	0.0003°C + 0.005% of reading
C	0.00043°C + 0.005% of reading
mV	0.5µV + 0.005% of reading

*Accuracy of Ni672 is 0.002°C

Table 4. *Accuracy with RTD, Thermocouple, Ohms, Potentiometer and Millivolt Inputs*

Input	Type	α	Ohms	Conformance Range	Input Accuracy/Repeatability	Maximum Range
RTD (2-, 3-, 4-Wire)	**Platinum**	0.003850	100	-200 to 850°C (-328 to 1562°F)	±0.1°C (±0.18°F)	-240 to 960°C (-400 to 1760°F)
			200			
			300			
			400			
			500			
			1000			
		0.003902	100	-100 to 650°C (-148 to 1202°F)		-150 to 720°C (-238 to 1328°F)
			200			
			400			
			500			
			1000			
		0.003916	100	-200 to 510°C (-328 to 950°F)		-240 to 580°C (-400 to 1076°F)
	Nickel	0.00672	120	-80 to 320°C (-112 to 608°F)		-100 to 360°C (-148 to 680°F)
	Copper	0.00427	9.035	-50 to 250°C (-58 to 482°F)	±0.85°C (±1.53°F)	-65 to 280°C (-85 to 536°F)
Ohms	**Direct Resistance**	n/a	0-4000	0-4000ohms	±0.4ohms	0-4095ohms
	Potentiometer		4000 max.	0-100%	±0.1%	0-100%
T/C	**J**	n/a	n/a	-180 to 760°C (-292 to 1400°F)	±0.25°C (±0.45°F)	-210 to 770°C (-346 to 1418°F)
	K	n/a	n/a	-150 to 1370°C (-238 to 2498°F)	±0.30°C (±0.54°F)	-270 to 1390°C (-454 to 2534°F)
	E	n/a	n/a	-170 to 1000°C (-274 to 1832°F)	±0.20°C (±0.36°F)	-270 to 1013°C (-454 to 1855.4°F)
	T	n/a	n/a	-170 to 400°C (-274 to 752°F)	±0.25°C (±0.45°F)	-270 to 407°C (-454 to 764.6°F)
	R	n/a	n/a	0 to 1760°C (32 to 3200°F)	±0.55°C (±0.99°F)	-50 to 1786°C (-58 to 3246.8°F)
	S	n/a	n/a	0 to 1760°C (32 to 3200°F)	±0.55°C (±0.99°F)	-50 to 1786°C (-58 to 3246.8°F)
	B	n/a	n/a	400 to 1820°C (752 to 3308°F)	±0.75°C (±1.35°F)	200 to 1836°C (392 to 3336.8°F)
	N	n/a	n/a	-130 to 1300°C (-202 to 2372°F)	±0.40°C (±0.72°F)	-270 to 1316°C (-454 to 2400.8°F)
	C	n/a	n/a	0 to 2300°C (32 to 4172°F)	±0.80°C (±1.44°F)	0 to 2338°C (32 to 4240.4°F)
mV	**mV**	n/a	n/a	n/a	±15µV	-50 to 1000mV

Figure 2. *TMZ (TPRG) Dimensions*

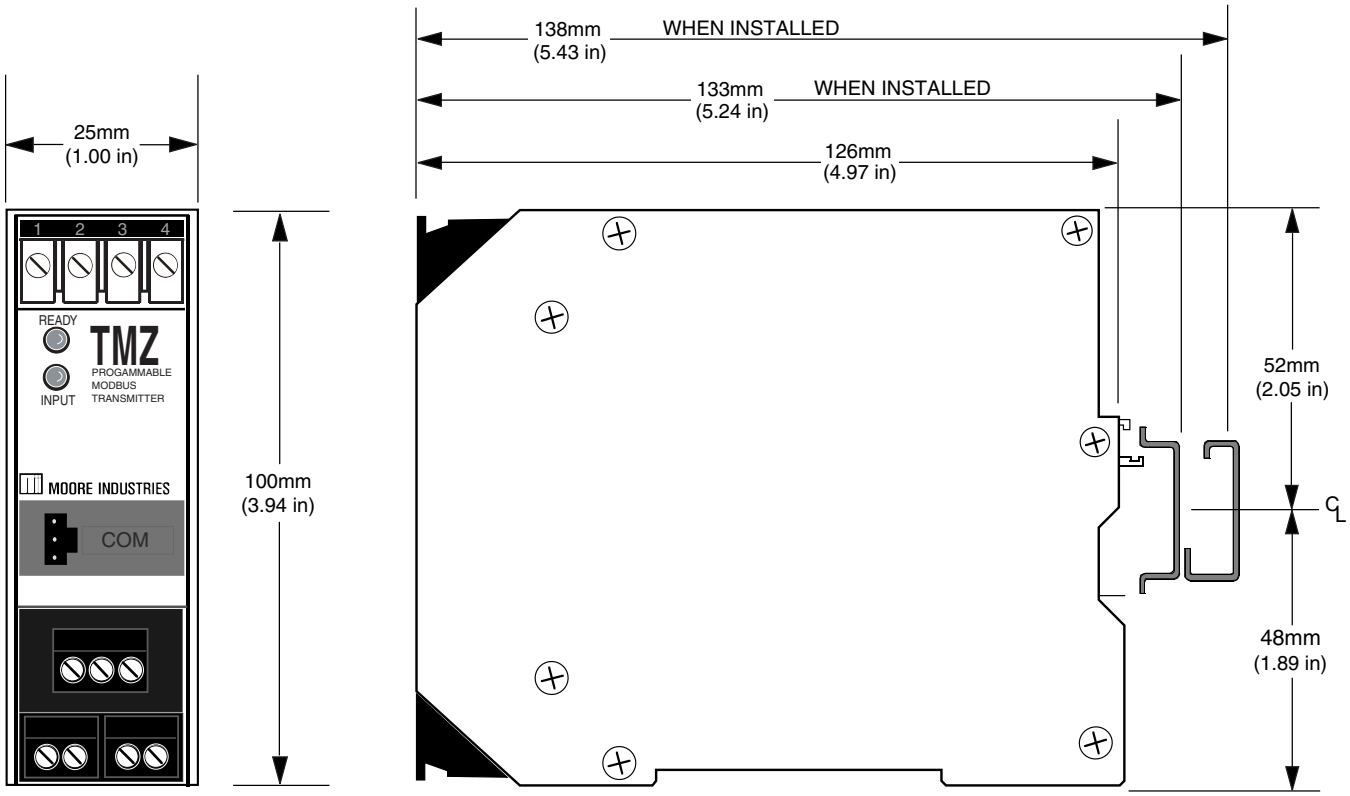


Table 5. *Terminal Designations*

Input Type	Top Terminals (Left to Right)			
	T1	T2	T3	T4
RTD, Ohms, Potentiometer, T/C & mV Inputs	See Figure 3			

		Bottom Terminals (Left to Right)			
		B1	B2	B3	B4
Row 1	MODBUS Output	A	B	S	Not Used
Row 2	Power	Not Used	Not Used	+	–

KEY:
A = A MODBUS
B = B MODUBUS
S = S MODBUS
+ = Positive power input
– = Negative power input

NOTES:
1. Terminal blocks can accommodate 14-22 AWG solid wiring.

Figure 3. *Temperature Sensor Hook-Up Guide*

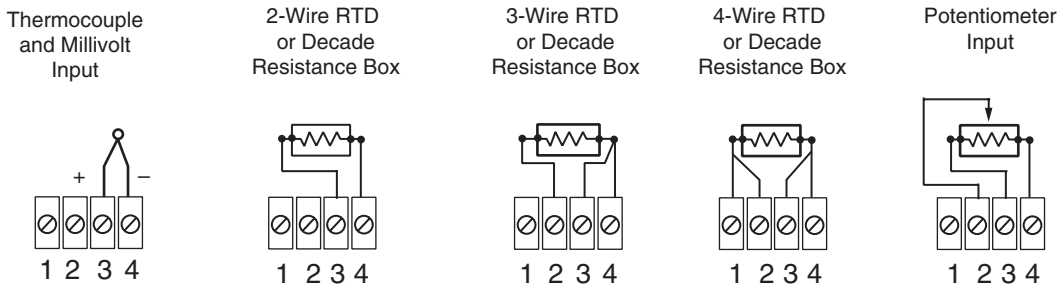
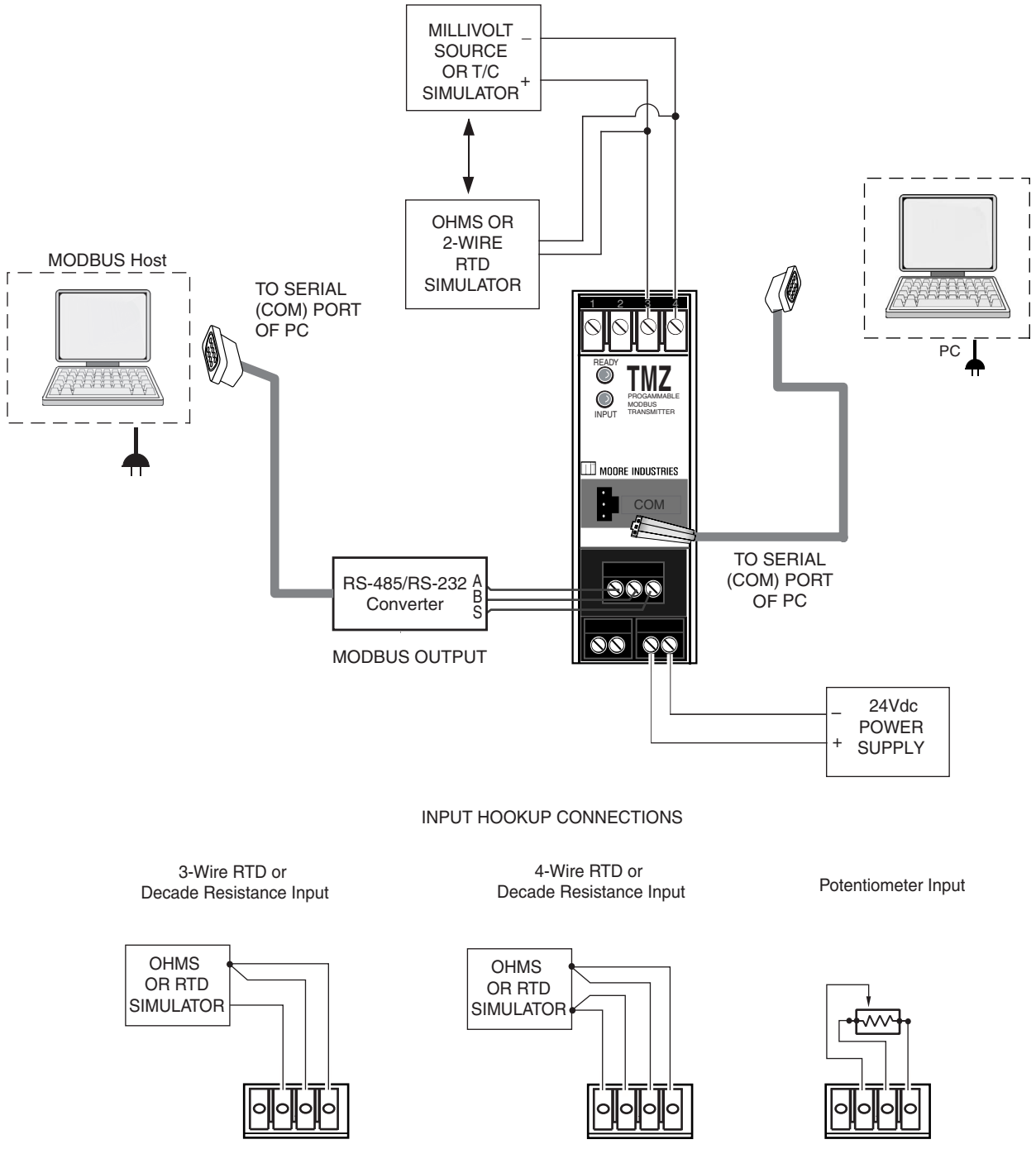


Figure 4. *Hooking-Up the TMZ (TPRG)*



Configuring the TMZ

One of the benefits of the TMZ is that there are no internal or external controls to adjust or settings to change. All operating parameters are set using a PC and Moore Industries' Intelligent PC Configuration Software.

The software settings are downloaded to the transmitter in the form of a Configuration File and stored in the instrument's memory. You can save a backup copy of the file on your PC hard drive or disk. The transmitter communicates with the PC through an RS-232 connection to the PC's serial port or through the MODBUS output with a fixed baud rate at 19.2k.

Installing the Configuration Software

Refer to Table 6 for the equipment needed.

1. Insert the *Moore Industries Interface Solution PC Configuration Software* CD into the CD drive of the PC. Access the CD and open the "TMZ PC Configuration Software" folder.
2. Double-click the installation program located in the folder. Follow the prompts to correctly install the program.

Once the Configuration Program is installed on the PC, the TMZ can be connected to equipment to simulate input and monitor output. You can then change the transmitter's operating parameters.

No Transmitter Needed

It is not necessary to connect the transmitter to a PC to create configuration files using the software. The Configuration Program can be run without connecting a transmitter, and ***most*** parameters can be set without the benefit of input from a sensor or TMZ.

This makes it easy to create a set of operating parameters, save them to disk, and download them to one or more transmitters at a later time.

The TMZ ***must*** be connected to the PC in order to: perform sensor trimming; assign a tag, descriptor or message; receive (via download) a configuration file; and save the configuration file from the transmitter's memory.

Connecting the TMZ to the PC

Connect the RS-232 end of the cable to the PC's COM port.

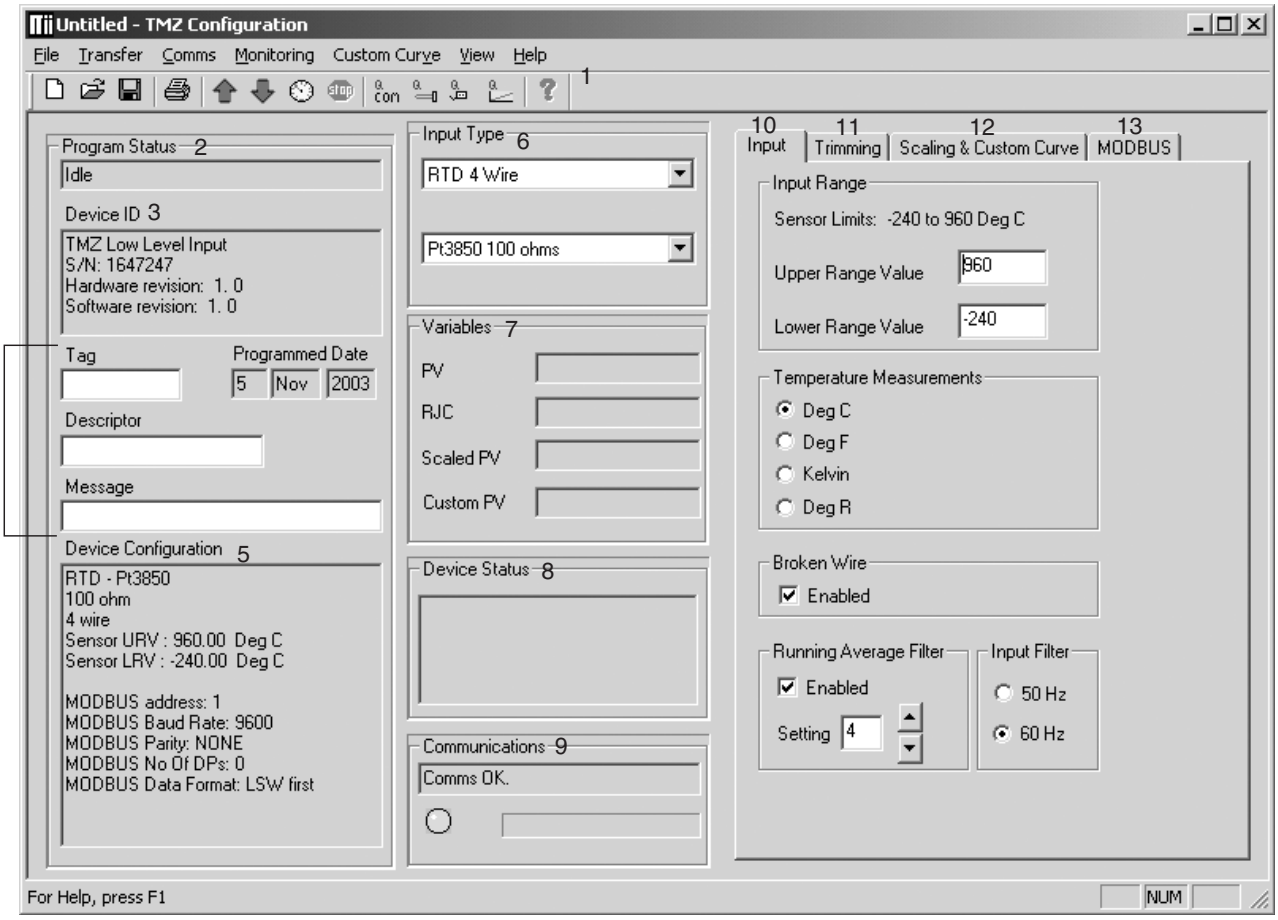
See Table 6 for information on the necessary equipment.

Table 6. *Assembling the equipment needed to configure the TMZ (TPRG)*

Device	Specifications
Variable Input Simulator for Thermocouple, RTD, Millivolt, Potentiometer, or Decade Resistance Box	Variable; Accurate to ±0.05% of unit span
Power Supply	24Vdc, ±10%
Personal Computer	80386-based(or faster) IBM PC, or 100% compatible; 1.44Mb floppy diskette drive 4Mb free RAM; 8Mb recommended; 20Mb free disk space on hard drive (More RAM & hard disk space is required for Windows 98, NT 2000 or XP) Microsoft Windows® 95, 98, NT, 2000 or XP Internet Explorer 3.0+ 1 (one) serial port (COM 1, 2, 3, or 4) set to 19.2k baud, no parity, 8 data bits, and 1 stop bit
Moore Industries PC Configuration Software	Version 1.0 or greater, successfully installed to the hard drive
Communication Cable	Part# 803-053-26

PC Configuration Software Summary

Figure 5. *TMZ (TPRG) PC Configuration Software Screen*



Once the default configuration has been saved to disk, it is safe to program other parameters. The PC Software is made up of these sections:

1. Tool Bar/Status Bar– Dropdown menus and corresponding icons allow you to perform various functions throughout the PC Configuration Program. *Refer to the Status and Tool Bar Legend* section for a complete description.

2. Program Status– This portion of the program displays the activity (idle, monitoring, downloading, uploading) of the connected unit.

3. Device ID– Displays your unit configuration (HLPRG/TPRG), ID, Hardware revision and Software revision.

4. Identification Parameters– Use this parameter to place an identifying "Tag" (8 alphanumeric characters max.), "Descriptor" (16 alphanumeric characters max.) or "Message" (32 alphanumeric characters max.). You may also use the *Quick Set* feature to set your *Tag* and download it. Simply click the button in the Tool Bar.

5. Device Configuration– Displays the *Input* and *MODBUS* parameters you have chosen as settings for your TMZ.

6. Input Type– Select your input type (RTD, T/C, Ohms, mV and Potentiometer) and characteristics.

7. Variables– Displays the value of the Process Variable that is being monitored, the Reference Junction temperature, the scaled output and the Custom Curve output.

8. Device Status– Notifies of any errors or conditions which are outside of tolerance range.

9. Communications– Indicates current PC connection/communications status.

10. Input– Use this tab to set your input parameters. Refer to the *Input* section for a complete description.

11. Trimming– This parameter allows you to configure and perform sensor trimming. Refer to the *Trimming* section for a complete description.

12. Scaling & Custom Curve– Use this portion of the screen to set up your custom curve table. Refer to the *Scaling & Custom Curve* section for a complete description.

13. MODBUS– Allows you to configure your MODBUS parameters. Refer to the *MODBUS* section for a complete description.

Status and Tool Bar Legend

Allows such functions as New, Open, Save and Print

Allows you to Upload and Download configurations

Select the PC Port (Comm Port) that you will use

Allows you to Monitor and Stop monitoring processes

Provides functions specific to your Custom Curve table

Controls whether Tool and Status Bars are viewed on the screen

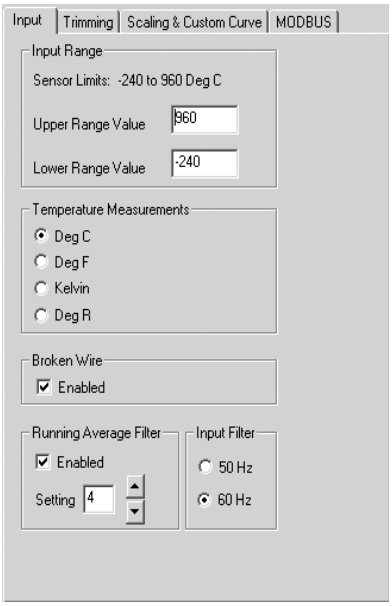
Displays the version of the TMZ Configuration Program

Quick Set Buttons

Configuration Screens

Input

Figure 6. *Input Tab*



Input Range– Allows you to set your "Upper Range Value" (URV) and "Lower Range Value" (LRV) depending upon the input configuration and range chosen in the *Input Type* section.

Temperature Measurements– Select the unit in which you wish your *Input Range* displayed. Choose from Deg C, Deg F, Kelvin or Deg R.

Broken Wire– Allows the TMZ to continuously test the integrity of your sensor wiring by sending out random microamp pulses during operation. If a problem is detected, a message is displayed in the *Device Status* box.

Running Average Filter– This function is for filtering the input signal. The TMZ provides this filter with a user-selected range between 1 and 16. Factory default is 4.

Note:
A higher Running Average Filter setting provides smoother output transitions however, reduces response time. Conversely, a lower setting provides a faster response time, but may seem more unstable.

Input Filter– This setting is used to configure the input filter. This filter is designed to reduce the effects of mains-induced noise. The input filter frequency value should be set to the frequency of the local AC supply-either 50Hz or 60Hz.

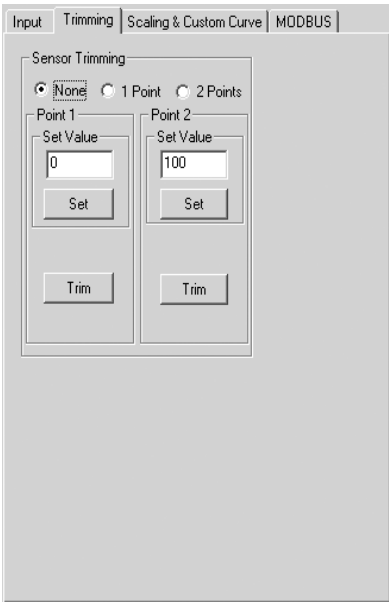
Note:
Once you have configured all parameters, download to the unit by selecting "Download" in the Transfer dropdown menu located in the Status Bar. You may also download by clicking the button in the Tool Bar.

You may also use the *Quick Set* feature to configure your *Input* parameters and download the settings.

Configure your parameters and click the button, located in the Tool Bar. The input settings you have chosen will be applied and downloaded to your unit.

Trimming

Figure 7. *Trimming Tab*



Sensor Trimming– Sensor Trimming increases the measurement accuracy of your instrument by matching the reading of its actual input to either a calibrated source or the device to which it is connected. This verifies that the input from the sensor to the transmitter is being interpreted correctly.

You may trim any point between 0% and 100% along the scale. Note that one-point trimming applies an offset to the sensor reading, while two-point trimming applies both an offset and a gain.

Follow the steps below in order to perform sensor trimming.

1. Select either “1 Point” (one-point trimming) or “2 Points” (two-point trimming) by clicking the appropriate button. Each pair consists of “Set” and “Trim” values.

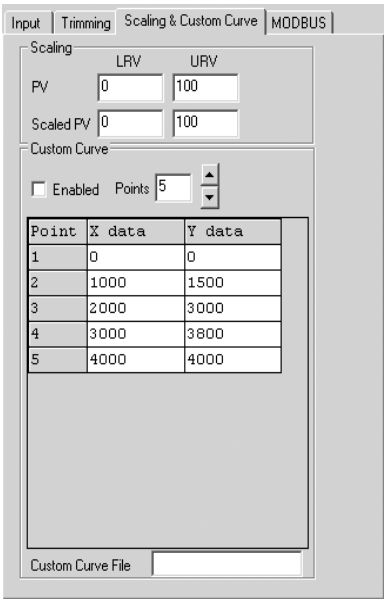
2. Enter the values that need to be trimmed into the “Set Value” field and click “Set”.

3. Apply the targeted signal to the input, wait until it settles and click “Trim” to capture the measured value. If you chose “2 Points”, repeat the step above for the second point.

Note:
Once you have configured all parameters, download to the unit by selecting “Download” in the Transfer dropdown menu located in the Status Bar. You may also download by clicking the *button in the Tool Bar.*

Scaling & Custom Curve

Figure 8. *Scaling & Custom Curve Tab*



Scaling– Scaling allows you to take your PV (Process Variable) reading and manipulate it to a more customized display range (Scaled PV). PV is the unit read after selecting your input type. For example, choosing a mV input would then produce a PV displayed in mV.

Should you require a Scaled PV, follow the instructions below.

1. In the “PV” parameter, enter the actual range of your input type. Place the minimum value in the “LRV” text box and the maximum value in the “URV” box.

2. In the “Scaled PV” parameter, enter the scale, or range you require. In the “LRV” text box, enter the value that you wish displayed when your reading is at its minimum. In the “URV” text box, place the value to be displayed when the process variable has reached maximum.

You may also use the *Quick Set* feature to configure your *Scaling* parameters and download the settings.

Configure your parameters and click the button, located in the Tool Bar. The settings you have chosen will be applied and downloaded to your unit.

Custom Curve– The Custom Curve feature allows you to setup your own custom curve table. This allows you to tell the transmitter what it should output when it receives a certain input. This feature also allows you the ability to write a table in Microsoft® Excel, save it in a .csv format, and import it into the Configuration Software. This makes it simple to save the custom table for downloading to multiple units or for backup purposes.

To create a custom curve:

1. Click the "Enabled" box .

2. Select the number of points for your curve (32 points maximum).

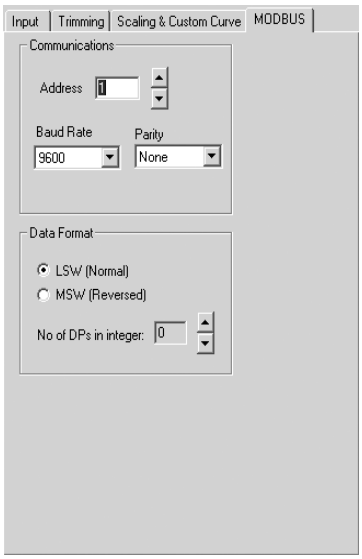
3. Type your individual values in the X and Y columns. Source variables are inserted into the X column while the corresponding data is inserted into the Y column.

4. After all of your data has been entered, you ***must*** use the *Custom Curve* dropdown menu to save your newly created custom ("Save Custom Curve") and to download it to your TMZ ("Download Custom Curve").

Note:
Once you have configured all parameters, download to the unit by selecting "Download" in the Transfer dropdown menu located in the Status Bar. You may also download by clicking the *button in the Tool Bar. However, this does not download your custom table. To do so, you must use the Custom Curve dropdown menu.*

MODBUS

Figure 9. *MODBUS Tab*



Communications– Used to set MODBUS Address, Baud Rate and Parity parameters.

Address- The number that the TMZ uses to identify itself on the MODBUS network. It is configurable from 1 to 247. By default, the assigned MODBUS address is 01.

Baud Rate- The speed of data transmission. It should be set to match the baud rate of the attached controller. Supported Baud Rates include: 300, 600, 1200, 2400, 4800, 9600, 19.2k and 38.4k. Factory default is 9600.

Parity- A method in serial asynchronous communications of "checking" that characters have been sent correctly. Even, Odd and no Parity (None) are supported. Factory default is None.

Data Format– Allows you to select the word order and number of decimal places you choose.

Selecting LSW (Normal), Least Significant Word, stores the most signifcant bits in the second register and the least significant bits in the first register (factory default).

MSW (Reversed), Most Significant Word, reverses the above order. The most significant bits will be stored in the first register with the least significant bits stored in the second register.

No of DPs in integer- This is a calculation that stores a more accurate value in the MODBUS register and offers better resolution. Select your value using the up and down arrows to the right of the display. See below for an example of this process.

PV = 123.456789

"No of DPs in integer" Value	Displayed Integer
1	1234
2	12345
3	123456

Note:

Once you have configured all parameters, download to the unit by selecting "Download" in the Transfer dropdown menu located in the Status Bar. You may also download by clicking the *button in the Tool Bar.*

You may also use the *Quick Set* feature to configure your *MODBUS* parameters and download the settings.

Configure your parameters and click the button, located in the Tool Bar. The settings you have chosen will be applied and downloaded to your unit.

Installation

Installation consists of physically mounting the unit and completing the electrical connections.

Mounting the TMZ

The TMZ can be mounted on standard DIN mounting rails.

Making the Electrical Connections

Please refer to Figure 4 for electrical connections.

Recommended Ground Wiring Practices

Moore Industries recommends the following ground wiring practices:

- Any Moore Industries product in a metal case or housing should be grounded.
- The protective earth conductor must be connected to a system safety earth ground before making any other connections.
- All input signals to, and output signals from, Moore Industries' products should be wired using a shielded, twisted pair technique. Shields are to be connected to an earth or safety ground at the unit itself.
- The maximum length of unshielded input and/or output signal wiring should be two inches.

CE Conformity

Installation of any Moore Industries' products that carry the CE certification ***must*** adhere to the guidelines above in order to meet the requirements set forth in applicable EMC directive (EN 61326-1). Consult the factory for the most current information on products that have been CE certified.

Operation

Once programmed, calibrated, installed, and supplied with the correct power, the TMZ transmitter begins to operate immediately. Depending upon environmental conditions, it can be expected to operate unattended for extended periods of time.

Maintenance

Moore Industries suggests a check for terminal tightness and general unit condition every 6-8 months. Always adhere to any site requirements for programmed maintenance.

Customer Support

Moore Industries is recognized as the industry leader in delivering top quality to its customers in products and services. We perform a battery of stringent quality assurance checks on every unit we ship. If any Moore Industries product fails to perform up to rated specifications, call us for help. Our highly skilled staff of trained technicians and engineers pride themselves on their ability to provide timely, accurate and practical answers to your process instrumentation questions.

Factory phone numbers are listed on the back cover of this manual.

If problems involve a particular TMZ (TPRG), there are several pieces of information that can be gathered ***before you call the factory*** that will help our staff get the answers you need ***in the shortest time possible***. For the fastest service, gather the complete model and serial number(s) of the problem unit(s) and the job number of the original sale.

Appendix A: TMZ MODBUS Register Set

Table A-1 contains all of the MODBUS integer registers supported by the TMZ. These registers constitute both the 30000 and 40000 register set.

Table A-1. *MODBUS Register Table*

Register	Variable	Read	Description
0	PV	R	PV (integer)
1	SV	R	SV (integer)
2	PercentOfRange	R	Percent of range (integer)
3	ScaledPV	R	Scaled PV (integer)
4	LinearedPV	R	Linearised PV (integer)
5	ErrorStatus	R	TMZ Error / Status Word
6	PV_STATUS	R	UFE PV Status
256-257	PV	R	PV (float)
258-259	SV	R	SV (float)
260-261	PercentOfRange	R	Percent of Range (float)
262-263	ScaledPV	R	Scaled PV (float)
264-265	LinearedPV	R	Linearised PV (float)
266	ErrorStatus	R	TMZ Error / Status Word (*)
267	PV_STATUS	R	UFE PV Status

CE Declaration of Conformity CE

EMC Directive 89/336/EEC

- **Manufacturer's Name:** Moore Industries-International, Inc.
- **Manufacturer's Address:** 16650 Schoenborn Street
  North Hills, CA 91343-6196
  USA

Declares that the product(s):

- **Product Name:** TMZ

	MODEL /	INPUT /	OUTPUT /	POWER /	OPTIONS /	HOUSING
• Model Number(s):	TMZ	*	*	20-30Vdc	*	[DIN]

* Indicates any input, output, power, option and housing as listed on the product data sheet

- **Conforms to the following EMC specifications:**
  EN 61326-1, 1998, Electromagnetic Compatibility requirements for electrical equipment for control use

- **Supplementary Information:**
  None

September 25, 2003
Date

Fred Adt
Quality Assurance Director

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RETURN PROCEDURES

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

   Warranty Repair –
   If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

   Non-Warranty Repair –
   If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
   a) A note listing the symptoms that indicate the unit needs repair
   b) Complete shipping information for return of the equipment after repair
   c) The name and phone number of the person to contact if questions arise at the factory

3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.

4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

WARRANTY DISCLAIMER

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ANY BUYER OF GOODS OR SERVICES FROM THE COMPANY AGREES WITH THE COMPANY THAT THE SOLE AND EXCLUSIVE REMEDIES FOR BREACH OF ANY WARRANTY CONCERNING THE GOODS OR SERVICES SHALL BE FOR THE COMPANY, AT ITS OPTION, TO REPAIR OR REPLACE THE GOODS OR SERVICES OR REFUND THE PURCHASE PRICE. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES EVEN IF THE COMPANY FAILS IN ANY ATTEMPT TO REMEDY DEFECTS IN THE GOODS OR SERVICES , BUT IN SUCH CASE THE BUYER SHALL BE ENTITLED TO NO MORE THAN A REFUND OF ALL MONIES PAID TO THE COMPANY BY THE BUYER FOR PURCHASE OF THE GOODS OR SERVICES.

ANY CAUSE OF ACTION FOR BREACH OF ANY WARRANTY BY THE COMPANY SHALL BE BARRED UNLESS THE COMPANY RECEIVES FROM THE BUYER A WRITTEN NOTICE OF THE ALLEGED DEFECT OR BREACH WITHIN TEN DAYS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH, AND NO ACTION FOR THE BREACH OF ANY WARRANTY SHALL BE COMMENCED BY THE BUYER ANY LATER THAN TWELVE MONTHS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH.

RETURN POLICY

For a period of thirty-six (36) months from the date of shipment, and under normal conditions of use and service, Moore Industries ("The Company") will at its option replace, repair or refund the purchase price for any of its manufactured products found, upon return to the Company (transportation charges prepaid and otherwise in accordance with the return procedures established by The Company), to be defective in material or workmanship. This policy extends to the original Buyer only and not to Buyer's customers or the users of Buyer's products, unless Buyer is an engineering contractor in which case the policy shall extend to Buyer's immediate customer only. This policy shall not apply if the product has been subject to alteration, misuse, accident, neglect or improper application, installation, or operation. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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MOORE INDUSTRIES

User's Manual Supplement

TMZ (2TPRG) Dual Input Model
with -SP2 Option in IP Housing

November 2004

Information contained within this supplement accompanies data in the TMZ (TPRG) User's Manual, 225-720-02, Revision B. This document addresses the TMZ (2TPRG) dual input model of the TMZ with the -SP2 Option and enclosed in an IP Housing. The TMZ (2TPRG) has a single MODBUS port. It also has two alarm relays and two inputs which provide two measurements per instrument. Inputs are individually configurable.

The -SP2 Option refers to a special 5mA excitation current feature for RTD Cu0427. This is provided to allow a more stable measurement with this RTD.

IP Housing refers to the orientation of input and output terminals in which power and output/relay terminals are located on the top of the instrument while input terminals are located at the bottom.

Note:

Unless otherwise stated, all specifications, tolerances and operating parameters for both inputs adhere to those described in the TMZ (TPRG) User's Manual.

Figure S-1. *The TMZ (TPRG) Dual Input in the IP Housing*

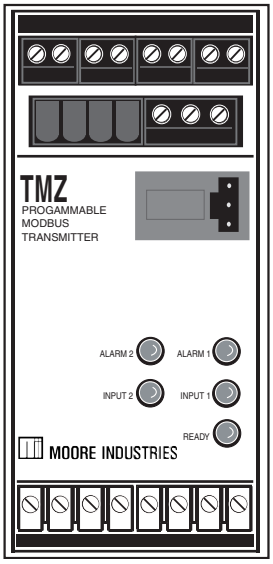

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Figure S-2. *Dimensions of the TMZ (2TPRG) in the IP Housing*

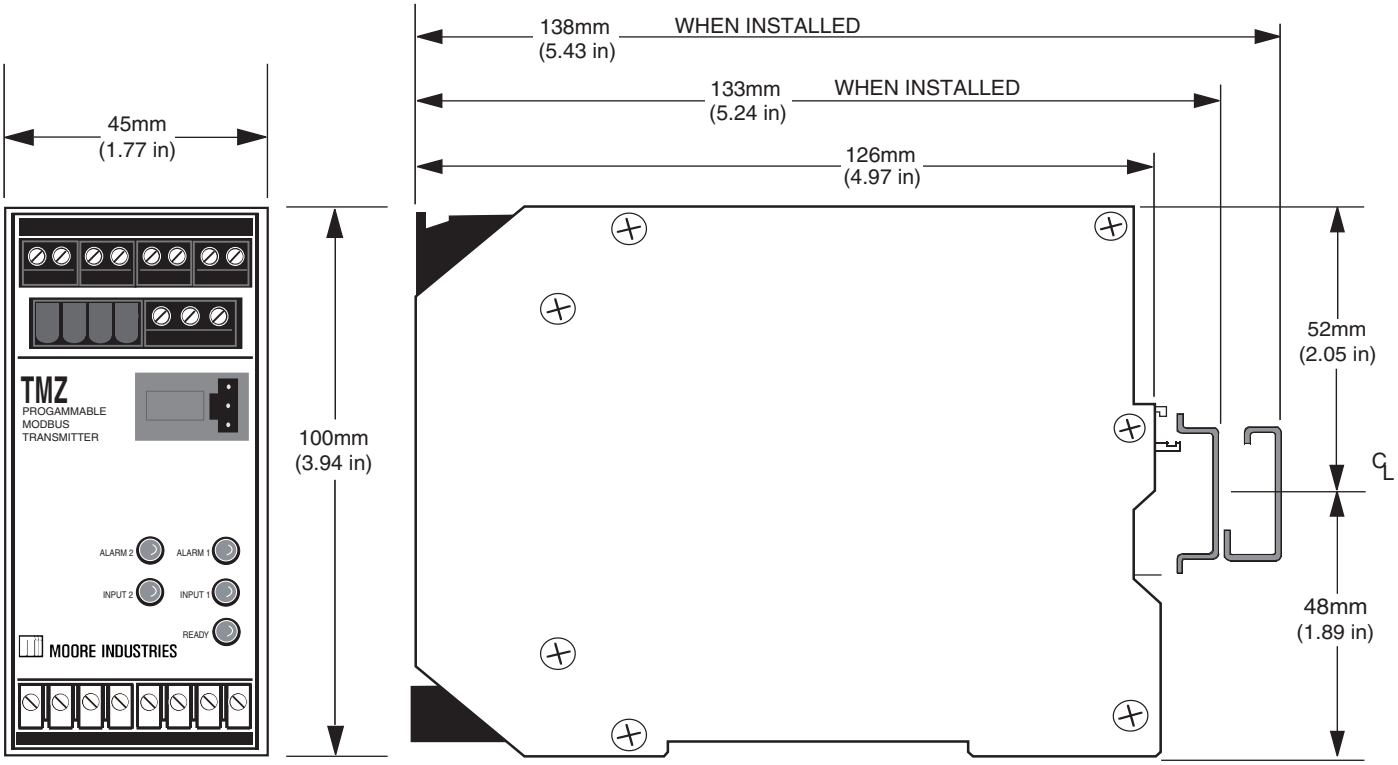


Table S-1. *Terminal Designations of the TMZ (2TPRG) in the IP Housing*

Power/Output	Top Terminals (Left to Right)							
	T1	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**
	DCC	DC	NC2	CM2	NO2	NC1	CM1	NO1

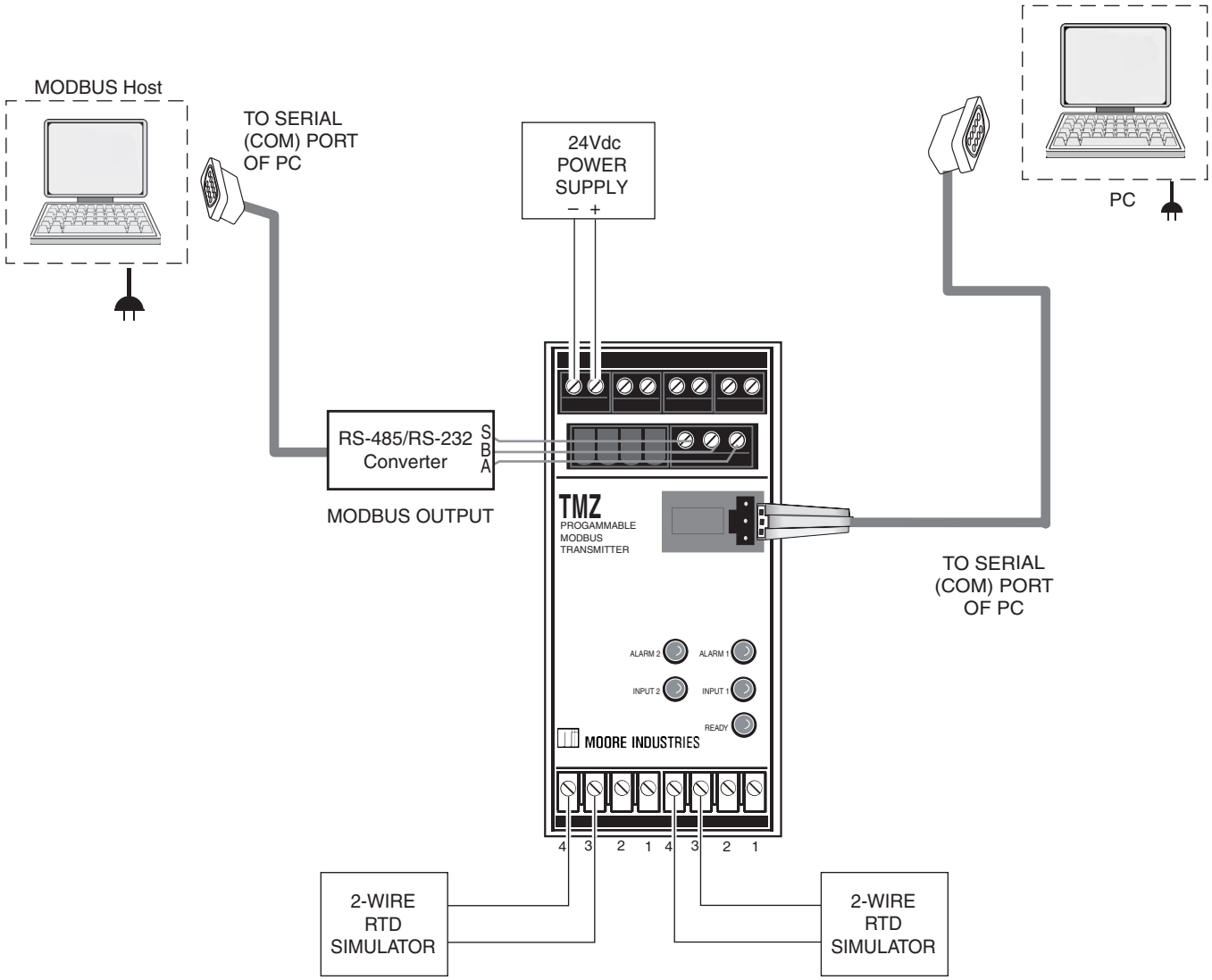
MODBUS Output	Middle Terminals (Left to Right)						
	M1	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**
	Not Used	Not Used	Not Used	Not Used	S	B	A

KEY:
DC = Positve power input
DCC = Negative power input
NC = Normally Closed
CM = Relay Common
NO = Normally Open
S = S MODBUS
B = B MODBUS
A = A MODBUS

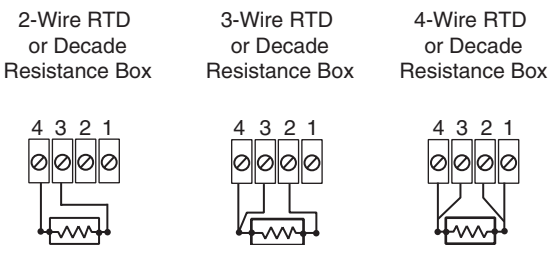
Input	Bottom Terminals (Left to Right)							
	B1	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**
RTD Inputs	See *Input Hook-Up Connections* portion of Figure S-3				See *Input Hook-Up Connections* portion of Figure S-3			

NOTES:
1. Terminal blocks can accommodate 14-22 AWG solid wiring.

Figure S-3. *Hooking-Up the TMZ (2TPRG) in the IP Housing*

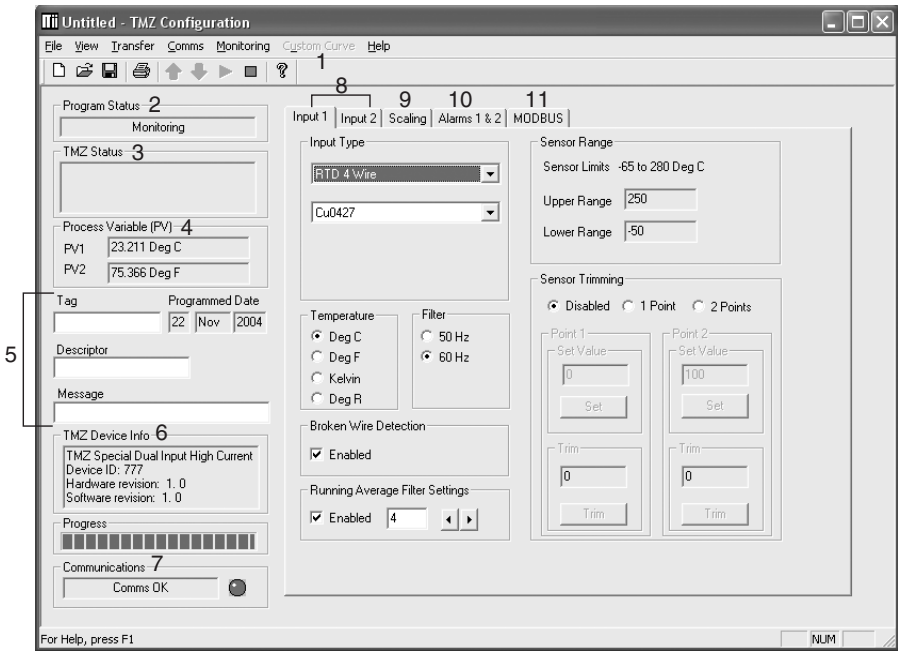


INPUT HOOK-UP CONNECTIONS



PC Configuration Software Summary of TMZ (2TPRG) Dual Input with -SP2 Option

Figure S-4. *Main Screen of the TMZ (TPRG) PC Configuration Software Program for Dual Input Units Configured with the -SP2 Option*



Once the default configuration has been saved to disk, it is safe to program other parameters. The PC Software is made up of these sections:

1. Tool Bar/Status Bar– Dropdown menus and corresponding icons allow you to perform various functions throughout the PC Configuration Program. *Refer to the Status and Tool Bar Legend* section of this document for a complete description.

2. Program Status– This portion of the program displays the activity (idle, monitoring, downloading, uploading) of the connected unit.

3. TMZ Status– Notifies of any errors or conditions which are outside of tolerance range.

4. Process Variable (PV)– Displays the values of the process variables that are being monitored.

5. Identification Parameters– Use this parameter to place an identifying "Tag" (8 alphanumeric characters max.), "Descriptor" (16 alphanumeric characters max.) or "Message" (32 alphanumeric characters max.).

6. TMZ Device Info– Displays your unit configuration, ID, Hardware revision and Software revision.

7. Communications– Indicates current PC connection/communications status.

8. Input 1 / Input 2 Tabs– Use these tabs to set your input parameters. Refer to the *Input 1 / Input 2* section for a complete description.

9. Scaling Tab– Use this portion of the screen to scale your instrument. Refer to the *Scaling* section for a complete description.

10. Alarms 1 & 2 Tab– Use this tab to set up your alarms. Refer to the *Alarms* section of this document for a complete description.

11. MODBUS– Allows you to configure your MODBUS parameters. Refer to the *MODBUS* section of TMZ (TPRG) User's Manual (Page 15) for a complete description.

Status and Tool Bar Legend

File — Allows such functions as New, Open, Save and Print

View — Controls whether Tool and Status Bars are viewed on the screen

Transfer — Allows you to Upload and Download configurations

Comms — Select the PC Port (Comm Port) that you will use

Monitoring — Allows you to Monitor and Stop monitoring processes

Help — Displays the version of the TMZ Configuration Program

Configuration Screens

Input 1 / Input 2

Figure S-5. *Input 1 / Input 2 Tab*

Note:
Sensor Trimming for each input to be trimmed is now performed at the respective Input tab (Input 1 or Input 2). Configuration remains as described in the TMZ (TPRG) User's Manual (Page 13).

In appearance, windows for both Input 1 and Input 2 are the same. They are configured similarly for the specific input chosen. Configuration of the Input windows follows the general parameters, with slight variation, as described in the TMZ (TPRG) User's Manual (Page 12).

Input Type– Select your input type (RTD 2 Wire, RTD 3 Wire or RTD 4 Wire).

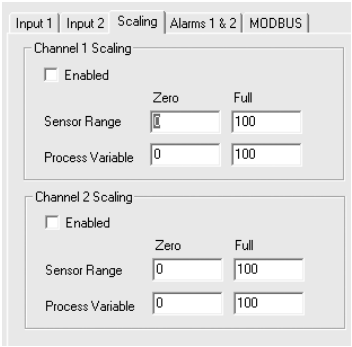
The *Sensor Range* section will adjust according to the parameters that have been set.

Temperature, Filter, Broken Wire Detection and Running Average Filter Settings configuration remains as described in the TMZ (TPRG) User's Manual (Page 12).

Scaling

Note:
The Custom Curve feature is not available with the TMZ (2TPRG).

Figure S-6. *Scaling Tab*



The following instructions apply to Channel 1 and Channel 2 Scaling configuration.

1. Select the "Enabled" checkbox of the channel you are configuring.

To scale the zero and full range span of your sensor, perform the following steps in the "Sensor Range" parameter.

2. Place the value you want displayed as the low, or zero end of your range in the "Zero" textbox.

3. Place the upper, or full range value in the "Full" textbox.

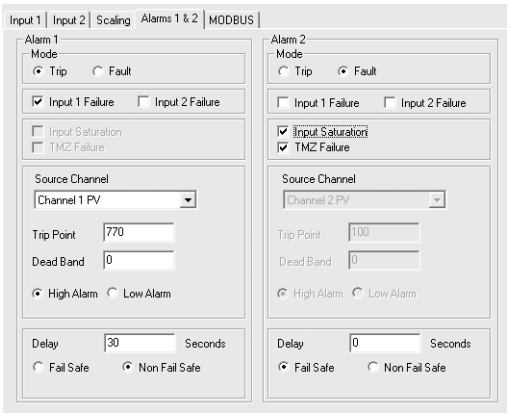
To scale the zero and full range span of your process variable reading, perform the following steps in the "Process Variable" parameter.

4. Place the value you want displayed as the low, or zero end of your range in the "Zero" textbox.

5. Place the upper, or full range value in the "Full" textbox.

Alarms 1 & 2

Figure S-7. *Alarms 1 & 2 Tab*



Mode– Click the appropriate button to configure your alarm as a Trip or Fault.

Trip– Notifies you if your process input drops below, or exceeds your trip point setting.

Fault– Alerts the user of a fault whenever one has been sensed.

Trip Alarm

Choosing the Trip Alarm, you are prompted to complete the following fields:

Input Failure– Check the appropriate box in order for your alarm to trip at a failure at Input 1, Input 2 or both.

Source Channel– From the dropdown menu, select the process variable to be used as reference for your selected trip point value. You may select Channel 1, Channel 2 or both.

Trip Point– The reference value used for notification.

In choosing your limits, you are setting the parameters for your unit to notify you if your process input drops below (Low Alarm) or exceeds (High Alarm) your trip point setting.

1. Select the "High Alarm" or "Low Alarm" button.

2. Enter the value you wish set as the trip point in the "Trip Point" text box.

Dead Band– The Dead Band is the range in which an alarm relay remains in an alarm condition even after the monitored process variable input has returned to a safe level, at or below/above the trip point setting.

3. If choosing to use a dead band value, enter it into the "Dead Band" text box

Delay– When your unit is in an alarm condition, the delay is the amount of time you set (0-120sec) to elapse before a relay trip.

4. Enter your delay time into the "Delay" text box.

Fail Safe/Non Fail Safe– A Fail Safe alarm, if in the alarm condition, will remain in the alarm condition even if power to the unit is removed. Its alarm trip relays are energized whenever the process input is in a non-alarm condition (including any dead band setting). These relays de-energize when the process input trips the alarm.

Non Fail Safe alarm trip relays are energized whenever the process input is in an alarm condition. These relays de-energize when the process input returns to the reset point (including any dead band).

Fault Alarm

The Fault Alarm enables the fields outlined below.

1. Select the type of Fault Alarm you require in your application.

Input Failure– Check the appropriate box in order for your alarm to notify you of a failure at Input 1, Input 2 or both.

Input Saturation– Should the input become overloaded, or saturated, your alarm would activate.

TMZ Failure– Choosing this parameter activates the alarm at any internal failure that occurs in the TMZ itself.

2. Enter your Delay value. Refer to the *Trip Alarm* section for further explanation.

3. Select a Fail Safe or Non Fail Safe alarm, and click the corresponding button. Refer to the *Trip Alarm* section for further explanation.

MODBUS

MODBUS configuration remains unchanged as described in the TMZ (TPRG) User's Manual (Page15).

TMZ MODBUS Register Set

Table S-2 contains all of the MODBUS integer registers supported by the TMZ (2TPRG) dual input model. These registers constitute both the 30000 and 40000 register set.

Table S-2. *MODBUS Register Table*

Register	Variable	Read/ Write	Description
0	PV1	R	PV1 (integer)
1	PV2	R	PV2 (integer)
2	SV1	R	SV1 (integer)
3	SV2	R	SV2 (integer)
4	PercentOfRange1	R	Percent of range channel 1 (integer)
5	PercentOfRange2	R	Percent of range channel 2 (integer)
6	ErrorStatus	R	TMZ dual input status information
7	Measured PV channel 1	R	Raw measurement from front-end channel 1
8	Measured PV channel 2	R	Raw measurement from front-end channel 2
9	ErrorStatus2	R	TMZ dual input additional status information
256-257	PV1	R	PV1 (float)
258-259	PV2	R	PV2 (float)
260-261	SV1	R	SV1 (float)
262-263	SV2	R	SV2 (float)
264-265	PercentOfRange1	R	Percent of range channel 1 (float)
266-267	PercentOfRange2	R	Percent of range channel 2 (float)
268	ErrorStatus	R	TMZ dual input status information
269	ErrorStatus2	R	TMZ dual input additional status information
512	TMZ_OffLine	R	TMZ on line (0) off line (1) mode
513	Model Type	R	Model Type 0 = low level (single input) 1= high level (single input) 2 = special RTD (single input) 3 = low level dual input 4 = high level dual input 5 = special RTD dual input
514	Channel 1 mode	W	MSB = measurement mode, LSB = sensor type code Measurement mode: 1 = RTD 2 wire 2 = RTD 3 wire 3 = RTD 4 wire 4 = mV 5 = resistance 2 wire 6 = resistance 3 wire 7 = resistance 4 wire 8 = thermocouple with no RJC compensation 9 = thermocouple 10 = potentiometer 17 = current 18 = voltage

Table continued on next page

515	Channel 1 configuration	W	MSB = byte 3, LSB = byte 4
516	Channel 2 mode	W	MSB = measurement mode, LSB = sensor type code
517	Channel 2 configuration	W	MSB = byte 3, LSB = byte 4
518	Channel 1 units of measure	W	MSB = PV units, LSB = SV units
519	Channel 2 units of measure	W	MSB = PV units, LSB = SV units
520	MODBUS address	W	LSB = MODBUS address (1-247)
521	MODBUS baud rate	W	MODBUS baud rate: 0 = 300 baud 1 = 600 baud 2 = 1200 baud 7 = 38400 baud
522	MODBUS parity	W	MODBUS parity: 0 = none 1 = odd 2 = even
523	MODBUS float format	W	MODBUS floating point mode: 0 = MSW first 1 = LSW first
526	Reset channel 1 trimming	W	Writing any value causes channel 1's trimming to be reset
527	Reset channel 2 trimming	W	Writing any value causes channel 2's trimming to be reset
528	Channel1_Trim_Lower	W	Writing any value to this register causes the TMZ dual input to trim the channel 1 lower point
529	Channel1_Trim_Upper	W	Writing any value to this register causes the TMZ dual input to trim the channel 1 upper point
530	Channel2_Trim_Lower	W	Writing any value to this register causes the TMZ dual input to trim the channel 2 lower point
531	Channel2_Trim_Upper	W	Writing any value to this register causes the TMZ dual input to trim the channel 2 upper point